

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:) Confirmation No.: 2594
Marc Weydert, et al.) Docket No.: DN2002105
For: STARCH COMPOSITE) Art Unit: 1796
REINFORCED RUBBER COMPOSITION)
AND TIRE WITH AT LEAST ONE) Examiner: William K. Cheung
COMPONENT THEREOF)
Serial No.: 10/603,023)
Filed: June 24, 2003)

Mail Stop Amendment
Commissioner for Patents
Alexandria, VA 22313-1450

DECLARATION UNDER 37 C.F.R. SECTION 1.132

Dear Sir:

I, Uwe Ernst Frank, do declare as follows:

1. I was awarded a PhD in Physical Chemistry from University of Saarbrücken, Germany in 1988. Since 1989, I have been employed by The Goodyear Tire & Rubber Company in the field of rubber and rubber chemicals research. As a result of my work at Goodyear, I have been named as an inventor or co-inventor on at least twenty-nine (29) U.S. Patents relating to tires, rubber and rubber chemicals. I am a co-inventor on the present application.

2. I have read and understood U.S. Patent No. 5,672,639 cited as prior art in the present application.

3. Under my direction and control, a series of rubber compounds were prepared to compare the effect of a maleic anhydride/polybutadiene adduct with the effect of an unmodified polybutadiene on a rubber composition. The rubber compound were prepared with base compositions identical to those in Example I of the specification, as given in the following Table A, with all amounts in parts per hundred rubber (phr).

Table A.

Natural rubber	100
Stearic acid	2
Wax	1.5
Zinc oxide	2.5
Sulfur	3
Accelerators	2.5
Antioxidants	3
Starch/Plasticizer Composite	30
Polybutadiene Additive	variable as per Table B

The samples were prepared with a maleic anhydride/polybutadiene adduct or an un-modified polybutadiene along with the base composition, as shown in Table B with amounts given in phr. The maleic anhydride/polybutadiene adduct and un-modified polybutadiene were of similar molecular weights and 1,2-vinyl contents.

Table B.

Sample No.	A	B	C	D	E	F	G
Maleic anhydride/polybutadiene adduct ¹	0	1.5	4.5	9	0	0	0
Un-modified polybutadiene ²	0	0	0	0	1.5	4.5	9

¹ Ricon 130MA20, M_n 3100, 20 weight percent maleic anhydride addition, 28 weight percent 1,2-vinyl, from Sartomer.

² Ricon 130, M_n 2500, 28 weight percent 1,2 vinyl, from Sartomer.

4. Samples A through G were tested for loss modulus G" using a Metravibe instrument operating at -10 °C and a frequency of 7.8 Hz. A strain sweep of each sample was done over a strain range of 0.7 to 25 percent. Results of the strain sweep are shown in the attached Figure A.

5. The comparison of the loss moduli at -10°C for samples containing maleic anhydride/polybutadiene adduct with samples containing un-modified polybutadiene from Figure A indicates a surprising effect in view of the prior art. The loss modulus G" at -10°C

for the un-modified polybutadiene compositions (Samples E, F, and G) was approximately constant over the strain range. By contrast, the loss modulus at -10°C for maleic anhydride/polybutadiene adduct compositions (Samples B, C, and D) was nonlinear over the strain range, consistent with the data of Table 7, Example II of the specification. This behavior is consistent with the specification suggestion (page 24, lines 14-23) that in the presence of the maleic anhydride/polybutadiene adduct, a core-shell interphase between the polymer matrix and the starch/plasticizer composite filler exists and remains soft at low temperature, and as a consequence can induce higher loss properties than is possible without the maleic anhydride/polybutadiene adduct. The lower stiffness at large strain may be attributed to the softer core shell with the adduct of maleic anhydride and polybutadiene, as compared to the un-modified polybutadiene. This finding is particularly surprising and unexpected in view of the teaching of Corvasce (U.S. Patent No. 5,672,639), which only teaches the use of the un-modified polybutadiene and does not teach such an effect for maleic anhydride/polybutadiene adduct.

6. The undersigned declared further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true and further that these statement are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated: September 10 2008



Uwe Ernst Frank

FIGURE A.
STRAIN SWEEP CHARACTERISATION ON SIMPLE SHEAR
Test Temp : -10°C / Freq.: 7.8 Hz

